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FIG. 1

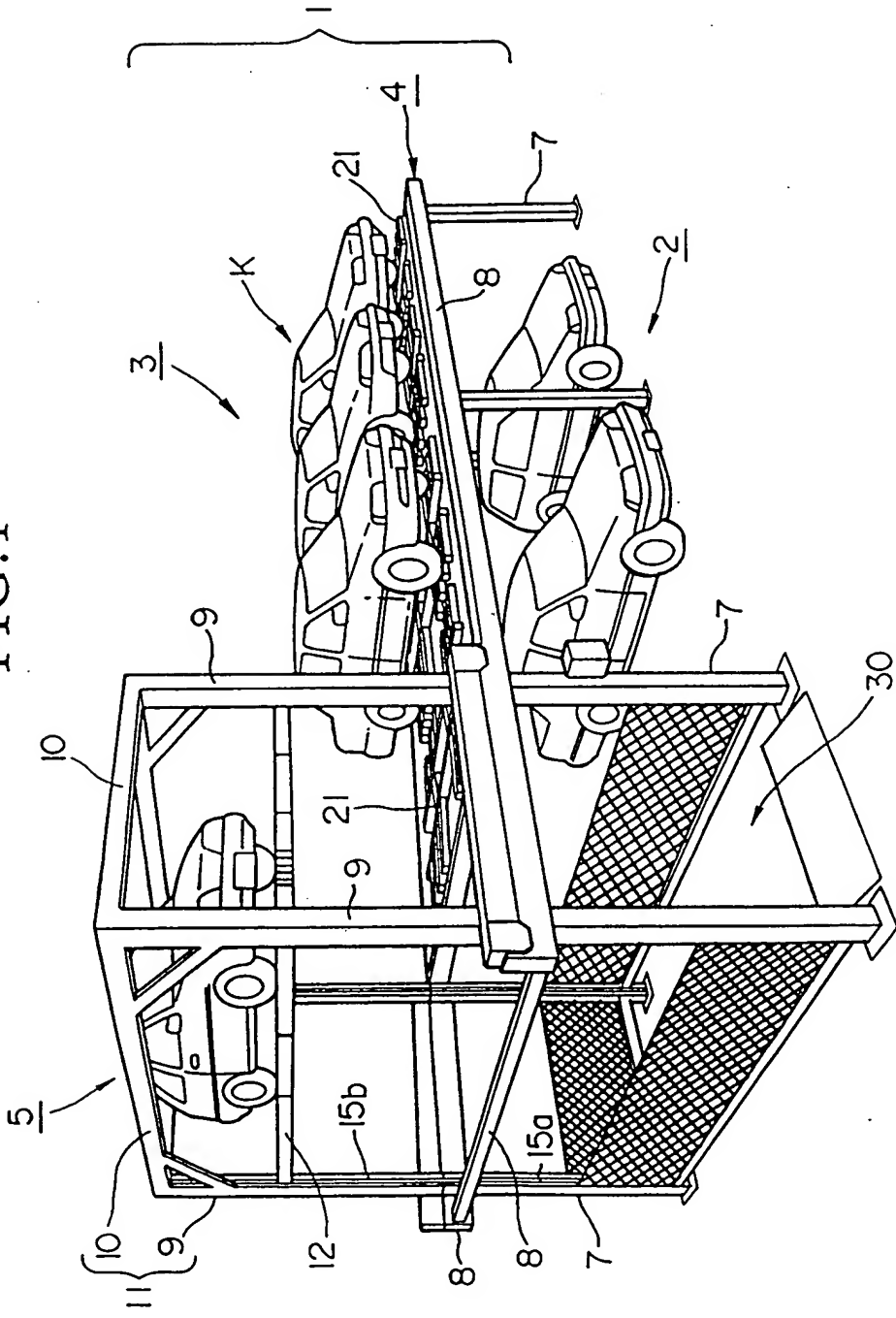


FIG.2

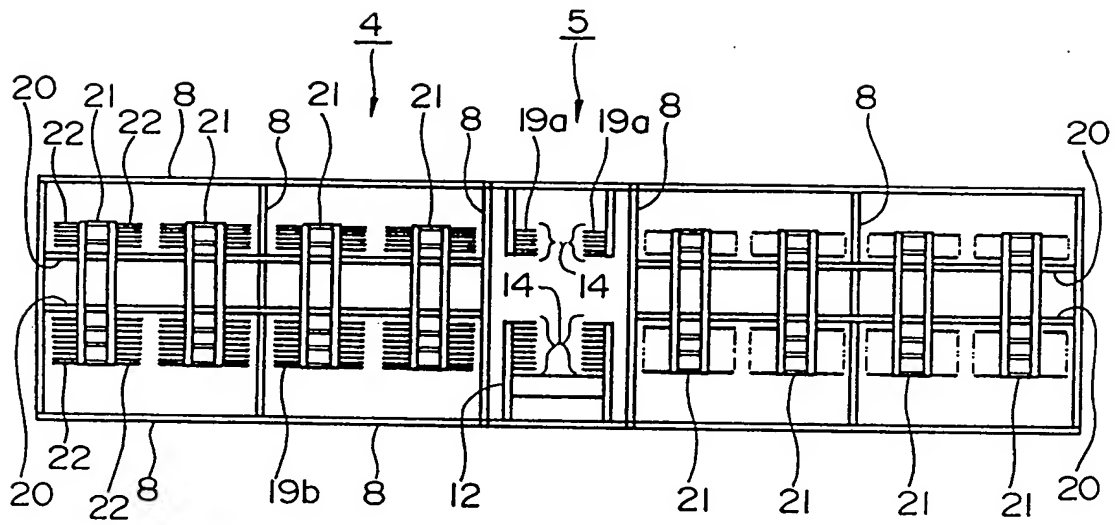
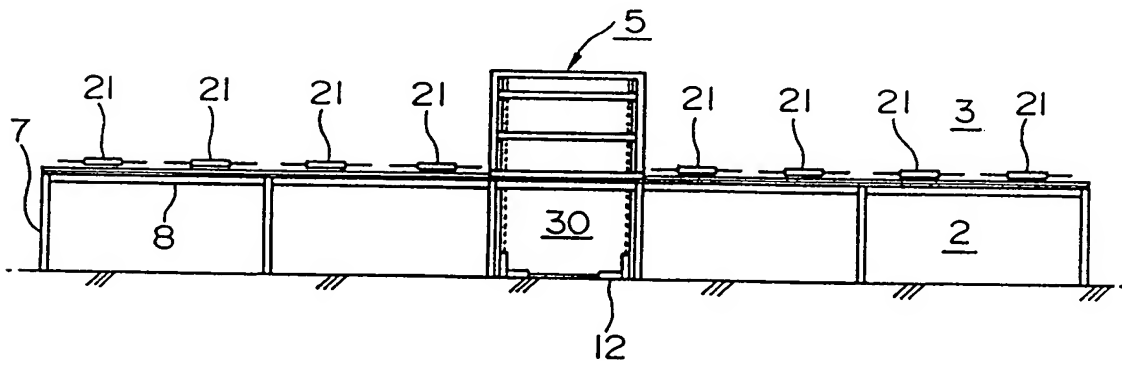


FIG.3



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FIG. 4

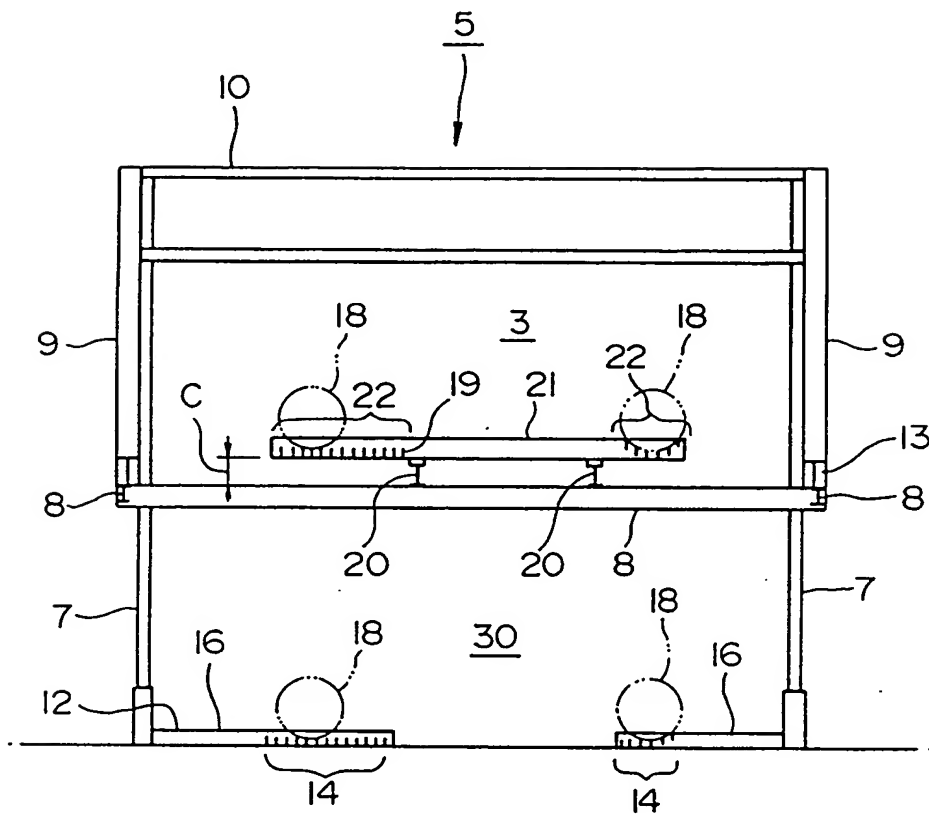
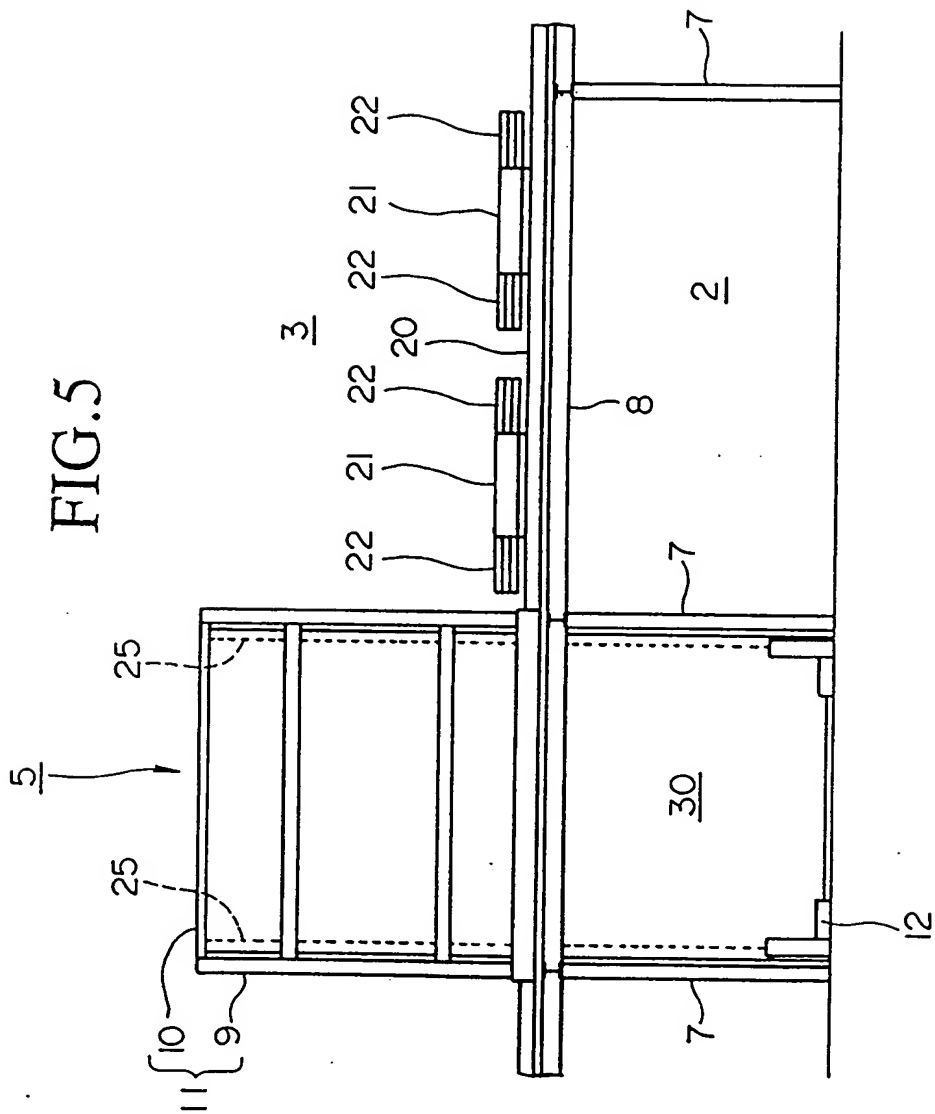


FIG.5



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FIG. 6

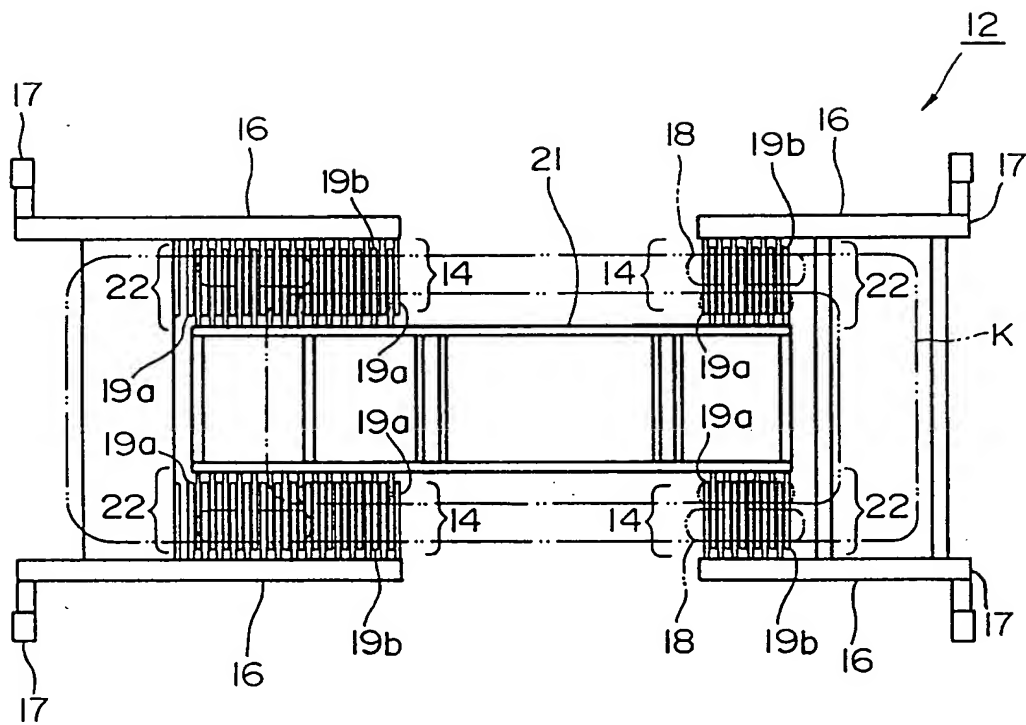
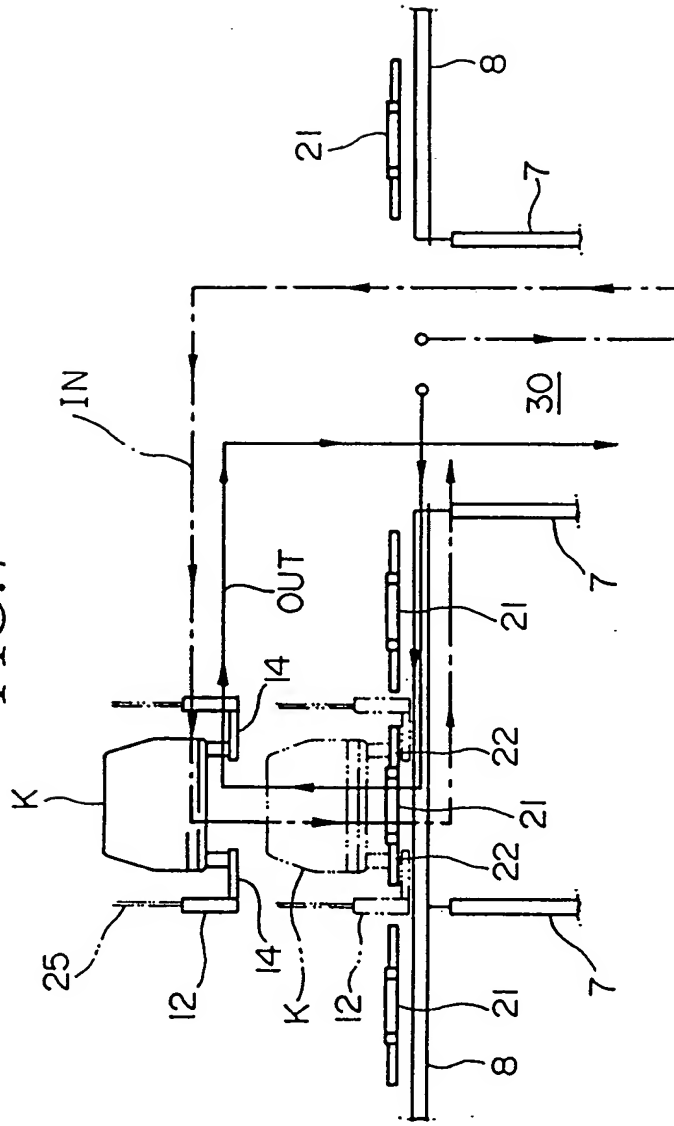


FIG. 7



AUTOMATIC STORAGE SYSTEM

BACKGROUND OF THE INVENTION

Field of the Invention

The present invention relates to an automatic storage system suitable for a mechanical automobile parking device, an automatic storehouse, or the like.

Related Art

Recently, in an automatic multi-level parking garage, a mechanical automobile parking device unit is often incorporated on every parking floor so as to increase the storage utility factor. The mechanical automobile parking device generally comprises a framework having upper and lower floors. Each of the floors in the framework has one or more parking pallets. The parking pallets are controlled by a switching operation for transfer in vertical and horizontal directions. The automobile parking device is organized as follows. When an automobile is about enter into the parking device, a vacant parking pallet is transferred to the entrance/exit gate of the parking device, thereafter the pallet occupied by the automobile is transferred back to the original position. When an automobile is about to exit the parking device, the pallet occupied by the automobile is transferred to the entrance/exit gate of the parking device. After the automobile has exited, the vacant parking pallet is

transferred back to the original position.

An automatic storehouse is organized so that goods to be stored are transferred from the entrance/exit gate to desired storage area in the storehouse and vice versa through a pallet by using a system similar to that of the afore-mentioned mechanical automobile parking device.

However, the conventional automatic storage system, which transfers an automobile or other goods to be stored to a desired portion using pallets, requires a step of transferring a vacant pallet to the entrance/exit gate when goods are about to be entered into the storage system, and a step of transferring a vacant pallet back to the original portion after goods have exited the storage system. Therefore, according to the conventional automatic storage system, much time is spent in taking goods in and out. Furthermore, such an automatic storage system requires a complicated movement of the pallet. Consequently, the conventional storage system has a problem of a complicated mechanism for transferring the pallet, and a complicated control process therefor.

SUMMARY OF THE INVENTION

Accordingly, it is a primary object of the invention to provide an automatic storage system having a simple mechanism for transferring goods.

It is another object of the invention to provide an automat-

ic storage system which can be controlled by simple steps and makes possible a decrease in time and costs for storage of goods.

It is yet another object of the invention to provide an automatic storage system which does not require the step of transferring a vacant pallet to the entrance/exit gate when goods are going to be entered into the automatic storage system, and the step of transferring a vacant pallet back to the original portion after goods have exited the automatic storage system.

In order to achieve the above object of the present invention, there is provided an automatic storage system comprising a framework having a storage area on the upper floor thereof, and a lift for transferring goods to the upper floor which is supported on the framework and can move in a horizontal direction along the framework, wherein the framework has a fixed carrier on the upper floor including a first receiving portion with a shape of the teeth of a comb, and the lift has a lifting carrier including a second receiving portion for receiving the goods with a shape of the teeth of a comb so that the goods can be transferred from one of the first and second receiving portions to the other.

It is preferable that the lifting carrier can move in a horizontal direction through the gap between the framework and the fixed carrier, accompanying the horizontal movement of the lift.

When goods such as automobiles are about to be stored in the automatic storage system, the goods are placed on the second receiving portion of the lifting carrier, which is supported by the lift, at the bottom position of the lifting carrier. The lifting

carrier occupied by the goods is transported upward, thereafter the lift containing the lifting carrier is moved in a horizontal direction and is transferred to a desired position in the second storage area on an upper floor of the framework. At the desired position in the second storage area, the lifting carrier is transferred downward so that the second receiving portion of the lifting carrier is passed through the first receiving portion of the fixed carrier on the framework. During the second receiving portion is passed through the first receiving portion, the goods (e.g., an automobile) on the second receiving portion is transferred on the first receiving portion, so that the storage of the goods is completed. The vacant lifting carrier is transferred back to the original position, passing through the gap between the framework and the first receiving portion of the fixed carrier, accompanying the horizontal movement of the lift.

When goods are about to be transferred out of the automatic storage system, the lifting carrier is transferred to the position on which the desired goods (e.g., an automobile) is stored, passing through the gap between the framework and the first receiving portion of the fixed carrier, accompanying the horizontal movement of the lift. At the desired position in the second storage area, the lifting carrier is transported upward so that the second receiving portion of the lifting carrier passes through the first receiving portion of the fixed carrier on the framework. During the second receiving portion passes through the first receiving portion, the goods (e.g., an automobile) on the first receiving portion is transferred on the second receiv-

ing portion. The lifting carrier with the goods is transferred over the framework in a horizontal direction to the position above the entrance/exit gate. Then, the lifting carrier with the goods is transferred downward to the bottom of the entrance/exit gate. Thus, the goods such as automobiles or the like are transferred out of the storage system.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view showing a mechanical automobile parking device according to an embodiment of the present invention.

FIG. 2 is a plan view showing the mechanical automobile parking device.

FIG. 3 is an elevation view showing the mechanical automobile parking device.

FIG. 4 is a side elevation view showing the mechanical automobile parking device.

FIG. 5 is an elevation view showing a principal portion of the mechanical automobile parking device.

FIG. 6 is a plan view showing the positional relationship between a lifting carrier and a fixed carrier.

FIG. 7 is a view for explaining the flow of goods which are transferred in and out of the mechanical automobile parking device.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

An embodiment of an automatic storage system according to the present invention is shown in FIGS. 1-8. This embodiment is an application of the invention into a mechanical automobile parking device.

As shown in FIGS. 1-3, a mechanical automobile parking device 1 according to the present invention comprises a framework 4 having a second parking area 3 on a second floor which is provided above a first parking area 2 on a first floor facing a road, and a lift 5 for transferring an automobile K from an entrance/exit gate to desired parking position of the second parking area 3 and vice versa.

The framework 4 has a rigid structure which comprises a plurality of pillars 7 in two columns set up on the ground at a regular intervals, and a plurality of large beams 8 attached to the pillars 7 to connect adjacent top ends of the pillars 7 so that they form a rectangular shape. A first parking area 2 on the first floor is housed in the inner side of the framework 4.

A lift 5 comprises a movable frame 11 and a lifting carrier 12. The movable frame 11 is constructed on four pillars 9 which bestride the front and back beams of the large beams 8 of the framework 4, and four upper end beams 10 which connect adjacent top ends of the pillars 9. The lifting carrier 12 is supported by the movable frame 11 so that the lifting carrier 12 can be transferred in a vertical direction using each of the inner surfaces of the four pillars 9 as a guide.

The movable frame 11 is self-propelled and can be transported on the front and back beams of the large beams 8 in a horizontal direction by means of wheels 13 (FIG. 4) which are driven by motors. The wheels 13 are provided on the bottom ends of the four pillars 9. The lifting carrier 12 has an automobile receiving portion (second receiving portion) 14 with four tire-placing portions which can receive the tires of an automobile K. Each of the four pillars 9 of the movable frame 11 has a groove 15 on the inner surface thereof (FIG. 1) in a vertical direction. As shown in FIGS. 4 and 6, the lifting carrier 12 has four horizontal frames 16 which are provided to surround the automobile K. Each of the end portions of the horizontal frames 16 is supported horizontally by the pillars 9 through four wheels 17. The lifting carrier 12 having these four horizontal frames 16 can be transferred along the pillars 9 in a vertical direction by driving chains 25, each one end of which is fixed to the upper end beams 10, as shown in FIG. 5. Each of the wheels 17 is guided by each of the grooves 15 of the pillars 9 and can move along each of them. As shown in FIG. 6, each of the tire-placing portions, which are attached to the four horizontal frames 16, has a shape like the teeth of a comb. Many parallel rods 19a of the second receiving portion are provided horizontally in parallel to each other at equal gaps. Combination of the many parallel rods 19a forms the automobile receiving portion 14.

On the other hand, as shown in FIG. 2, small beams 20 in two columns parallel to each other are attached to the large beams 8 to connect the adjacent large beams 8. On the small beams 20 in

two columns, a plurality of fixed carriers 21, which is used for parking an automobile which has been lifted to the second floor by the lift 5, are attached at the predetermined portions. Each of these fixed carriers 21 has two parallel horizontal frames smaller than the four horizontal frames 16 of the lifting carrier 12. To each of the horizontal frames of the fixed carrier 21, a first receiving portion 22 with a four tire-placing portions, on which the tires 18 of an automobile K are to be placed, is provided. Each of the tire-placing portions, which are attached to the frames of the fixed carrier 21, has a shape like the teeth of a comb. Many parallel rods of the first receiving portion 22 are provided horizontally in parallel to each other at equal gaps, similarly to the second receiving portion 14 of the lifting carrier 12. The fixed carrier 21 is provided apart from the upper surface of the framework 4 at a distance C by using a small beams 20, as shown in FIG. 4.

The relationship of position between the lifting carrier 12 and the fixed carrier 21 will be explained as follows.

When the center of the lifting carrier 12, which is transferred on the framework 4 in a horizontal direction, is coincident with that of the fixed carrier 21 as shown in FIG. 6, the lifting carrier 12 and the fixed carrier 21 are provided so that each element of the lifting carrier 12 does not interfere with that of the fixed carrier 21 in plan view. That is, the lifting carrier 12 can move downward from the position just above the fixed carrier 21 to the lower position thereof without interference. During the downward movement of the lifting carrier 12,

the teeth 19a of the second receiving portion 14 of the lifting carrier 12 passes through the gaps between the teeth 19b of the first receiving portion 22 of the fixed carrier 21.

The motor drive for driving the lift 5 in a horizontal direction and the chain drive for driving the lift 5 in a vertical direction can be operated by a control panel on the ground. The transferring of an automobile into and out of the parking area may be automatically controlled by a computer.

The operation of the mechanical automobile parking system having above mentioned construction will be explained.

Steps for transferring an automobile K into the parking area on the second floor are as follows.

In FIGS. 1 and 7, the lifting carrier 12 in the lift 5 is transferred downward from the position just above the entrance/exit gate 30 of the framework 4 by using remote-control driving of the chain 25. The lifting carrier 12 goes down along the grooves 15b of the pillars 9 of the lift 5, thereafter goes down along the grooves 15a of the pillars 7 forming a part of the entrance/exit gate 30, and stops at the bottom of the entrance/exit gate 30. Then, an automobile K is entered into the entrance/exit gate 30 so that the tires 18 of the automobile K are placed on the automobile receiving portion 14 of the lifting carrier 12 (FIG. 4). Thereafter, the lifting carrier 12 occupied by the automobile K is transported upward along the pillars 7 and 9 by reverse-driving of the chain 25, and the lifting carrier 12 is returned into the lift 5.

Next, driving the motor by remote-control, the lift 5 having

the automobile K is transferred on the large beam 8 in a horizontal direction to stop at the position just above the desired fixed carrier 21 in the parking area on the second floor. From the position, the lifting carrier 12 in the lift 5 is transferred downward by driving the chain 25. During the downward transfer of the lifting carrier 12, the teeth 19a of the second receiving portion 14 of the lifting carrier 12 passes through the gaps between the teeth 19b of the first receiving portion 22 of the fixed carrier 21. When the teeth 19a of the second receiving portion 14 passes through the gaps between the teeth 19b of the first receiving portion 22 without interference, the automobile K on the second receiving portion 14 of the lifting carrier 12 is transferred onto the first receiving portion 22 of the desired fixed carrier 21. Thus, parking of the automobile K to the desired fixed carrier 21 is completed. Then, the lifting carrier 12, which has been passed through below the fixed carrier 21, may be returned to the position above the entrance/exit gate 30 through the gap having a distance C between the fixed carrier 21 and the large beams 8 of the framework 4, accompanying the horizontal movement to the side of the entrance/exit 30 gate of the lift 5. In this way, it is possible to repeat the operations for transferring an automobile into the parking area on the second floor. These operations are automatically controlled by a computer.

Steps for transferring an automobile from the parking area on the second floor to the entrance/exit gate 30 are as follows.

First, the lift 5 with the lifting carrier 12 is transferred

to the fixed carrier 21 occupied by a desired automobile in a horizontal direction by driving motors. The lifting carrier 12 is simultaneously transferred through the gap between the fixed carrier 21 and the large beams 8 of the framework 4, and is stopped at the position just under the fixed carrier 21 having the desired automobile. From the position, the lifting carrier 12 is lifted up by driving the chain 25. When the second automobile receiving portion 14 of the lifting carrier 12 passes through the first automobile receiving portion 22 of the desired fixed carrier 21, the desired automobile K placed on the first receiving portion 22 is transferred onto the second receiving portion 14 of the lifting carrier 12. Then, the lift 5 having the automobile K on the lifting carrier 12 is transferred to the entrance/exit gate 30 in a horizontal direction by driving motors again, and is stopped at the position just above the entrance/exit gate 30. From the position, the lifting carrier 12 having the automobile K is transferred downward to the ground of the entrance/exit gate 30 by means of driving of chains 25. Thus, transferring an automobile out of the parking system is performed. By transferring the lift 5 in a horizontal direction to transfer the lifting carrier 12 for the position just under the fixed carrier 21 having a next desired automobile, the operations for transferring an automobile out of the parking system may be repeated.

The automobile parking system according to the embodiment does not require a conventional type of parking pallet. Therefore, the embodiment does not require the step of transferring a

vacant pallet to the entrance/exit gate when an automobile is about to be entered into the parking system, and the step of transporting a vacant pallet back to the original portion after an automobile has exited the storage system. Consequently, the embodiment makes it possible to reduce the time and costs for parking of an automobile. Furthermore, this embodiment provides an automobile parking system having a simple mechanism which can be controlled by simple transfer steps.

Especially, the automobile parking system according to the embodiment utilizes a combination of the lifting carrier 12, having the second automobile receiving portion 14 with a shape of the teeth of a comb, and fixed carriers 21 having the first automobile receiving portion 22 with a shape of the teeth of a comb, each of the first and second automobile receiving portions transferring an automobile to each other, and utilizes the gap between the large beams 8 of the framework 4 and the fixed carriers 21 for transfer of the lifting carrier 12 in a horizontal direction. Consequently, the movement route of the lifting carrier 12 for transferring an automobile in or out of the parking area is simplified. Therefore, it is possible to reduce the time and costs for parking of automobiles, and to simplify the control process of the automobile parking system.

The above-described embodiment shows only a mechanical automobile parking system. However, it is possible to apply the present invention to storage systems other than the mechanical automobile parking system, e.g., an automatic storehouse. In the case of the application to the automatic storehouse, fixed carri-

ers 21 may be provided on a shelf divided according to the type of goods. A type of goods are placed on the lifting carrier 12 at the entrance/exit gate 30. Then, the goods on the lifting carrier 12 are transported to the desired shelf, accompanying the vertical and horizontal movements of the lift 5. The goods are transferred from the lifting carrier 12 to the desired fixed carrier 21 on the shelf due to the vertical movement of the lifting carrier 12, so that the storage of the goods may be performed. Transfer of goods from the fixed carrier 21 on the shelf to the entrance/exit gate 30 can be carried out by steps similar to those in the case of the automobile parking. Such an automatic storehouse provide effects similar to those of the embodiment of the automobile parking system.

As described above, the storage system according to the present invention comprises a framework having a storage area on the upper floor thereof, and a lift for transferring goods to be stored into the storage area on the upper floor which is supported on the framework and can move in a horizontal direction along said framework, wherein the framework has a fixed carrier on the upper floor including a first receiving portion with a shape of the teeth of a comb, and the lift has a lifting carrier including a second receiving portion for receiving the goods with a shape of the teeth of a comb so that the goods can be transferred from one of the first and second receiving portions to the other. Therefore, according to the present invention, it is possible to provide a storage system having a simple mechanism for transferring goods. Furthermore, it is possible to reduce the time and

costs for storage of goods, and to simplify the control process of the storage system.

As will be obvious to those skilled in the art, the present invention provides a system innovation having very wide applicability, and can be practiced in the context of a very wide variety of storage system and with a very wide variety of modification and variations. The scope of the claimed invention is therefore not limited except as specified in the accompanying claims.

What is claimed is:

1. An automatic storage system comprising: a framework (4) having a storage area (3) on an upper floor thereof, and a lift (5) for transporting goods to be stored into said storage area (3) on the upper floor which is supported on said framework (4) and can move in a horizontal direction along said framework (4);

characterized in that

wherein said framework (4) has a fixed carrier (21) on the upper floor including a first receiving portion (22) with a shape of the teeth of a comb, and said lift (5) has a lifting carrier (12) including a second receiving portion (14) for receiving said goods with a shape of the teeth of a comb so that said goods can be transferred from one of said first and second receiving portions (22, 14) to the other.

2. An automatic storage system as claimed in claim 1, wherein said lifting carrier (12) can move in a horizontal direction through the gap between said framework (4) and said fixed carrier (21), accompanying the horizontal movement of said lift (5).

3. An automatic storage system as claimed in claim 1, wherein said framework (4) has a storage area on each of upper and lower floors.

4. An automatic storage system as claimed in claim 1, wherein said lift (5) comprises four pillars (9), four upper end beams (10) which are attached to said pillars (9) to connect adjacent top ends of said pillars (9), and said lifting carrier (12) which can be transferred in a vertical direction along said four pillars (9).

5. An automatic storage system as claimed in claim 4, wherein said lift (5) can be transferred on said framework (4) in a horizontal direction by means of wheels driven by motors, which are provided on bottom ends of the pillars (9) of said lift (5).

6. An automatic storage system as claimed in claim 4, wherein said pillars (9) have grooves (15b) on the inner surfaces thereof in a vertical direction and said lifting carrier (12) can be transported in a vertical direction by using said grooves (15b) of said pillars (9) as a guide.

7. An automatic storage system as claimed in claim 6, wherein said lifting carrier (12) has wheels (17) on the end portions thereof, the wheels (17) being guided by said grooves (15b) of the pillars (9) to move in a vertical direction along the pillars (9).

8. An automatic storage system as claimed in claim 1, wherein said lifting carrier (12) can be transported in a verti-

cal direction by driving chains (25) which is provided on said lift (5).

9. An automatic storage system as claimed in claim 1, wherein transfer of goods from one of said first and second receiving portions (22,14) to the other is carried out, during said lifting carrier (12) being transported from the position above or under the desired fixed carrier (21) in a vertical direction to pass through said desired fixed carrier (21).

10. An automatic storage system as claimed in claim 9, wherein said the teeth of the second receiving portion (14) of said lifting carrier (12) passes through the gaps between the teeth of the first receiving portion (22) of said desired fixed carrier (21), when said lifting carrier (12) passes through said fixed carrier (21).

11. An automatic storage system as claimed in claim 9, wherein said fixed carrier (21) has horizontal frames smaller than the four horizontal frames (16) of said lifting carrier (12).

12. An automatic storage system as claimed in claim 8, wherein driving of said lift (5) in a horizontal direction and of said lifting carrier (12) in a vertical direction are carried out by remote-control.

13. An automatic storage system as claimed in claim 1, wherein said automatic storage system is an automobile parking system.

14. An automatic storage system as claimed in claim 1, wherein said automatic storage system is an automatic storehouse for goods.

15. The automatic storage system substantially as herein described with reference to and as shown in the accompanying drawings.

Patents Act 1977

**Examiner's report to the Comptroller under
Section 17 (The Search Report)**

Application number

9125776.6

Relevant Technical fields

Search Examiner

(i) UK CI (Edition K) BSW WB WD

D MCMUNN

(ii) Int CI (Edition 5) E04H 6/18

Date of Search

Databases (see over)

(i) UK Patent Office

25 MARCH 1992

(ii)

Documents considered relevant following a search in respect of claims

1-15

Category (see over)	Identity of document and relevant passages	Relevant to claim(s)
X	GB 2234743 (YOKOI)	1-4, 9-14
X	GB 1050182 (SPEED-POSH)	1-3, 9-14
X	GB 1023991 (KING)	1-3, 9-14
X	GB 965140 (SPEED-POSH)	1-3, 9-14
X	GB 891905 (VIALE)	1-3, 9-14
X	GB 830418 (ROUMEFORT)	1-3, 9-14
X	EP 0275004 (BRAGAGLIO)	1-6, 9-14
X	WO 88/01331 (KNAKRICH)	1-3, 9-14
X	US 3896955 (COLLINS)	1-3, 9-14

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Category	Identity of document and relevant passages	Relevant to claim(s)

Categories of documents

X: Document indicating lack of novelty or of inventive step.

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